



# ENERGY STAR® Small Network Equipment

Online Stakeholder Meeting

November 19, 2009

12:00 – 2:00 EST



Learn more at [energystar.gov](http://energystar.gov)



# Welcome and Introductions

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# Introductions

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- US EPA
  - Una Song
  - Katharine Kaplan
- ICF International
  - Evan Haines
  - Kate Williams
- Terra Novum
  - Tom Bolioli
- Lawrence Berkeley National Laboratory
  - Steven Lanzisera
  - Bruce Nordman

# Agenda



- Introductions 5 min.
  - ENERGY STAR Overview 20 min.  
*Una Song, U.S. EPA*
- Guided Discussion of Draft Framework
- I. Definitions and Concepts 20 min.  
*Evan Haines, ICF International*
  - II. Anticipated Program Scope and Product Types 20 min.  
*Evan Haines, ICF International*
  - III. Features and Testing Approach 40 min.  
*Steven Lanzisera, LBNL*  
*Bruce Nordman, LBNL*  
*Tom Bolioli, Terra Novum*
- Wrap Up
- Preliminary Timeline & Adjourn 15 min.  
*Una Song, U.S. EPA*

# Logistics

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- Guided discussion
  - Three focus areas: Definitions and Concepts, Scope/Product Types, and Test Procedures/Criteria
  - For each area, brief presentations to scope out issues followed by structured discussion
  - Please keep phone lines on mute during presentation portions; feel free to send written comments to presenters via LiveMeeting interface
  - Moderator will notify participants as structured discussion begins
- Slides to be posted to the ENERGY STAR website by early next week

# ENERGY STAR Program Overview



- What is ENERGY STAR?



- *A voluntary public-private partnership program*
- *A driver for energy efficient product design and selection*

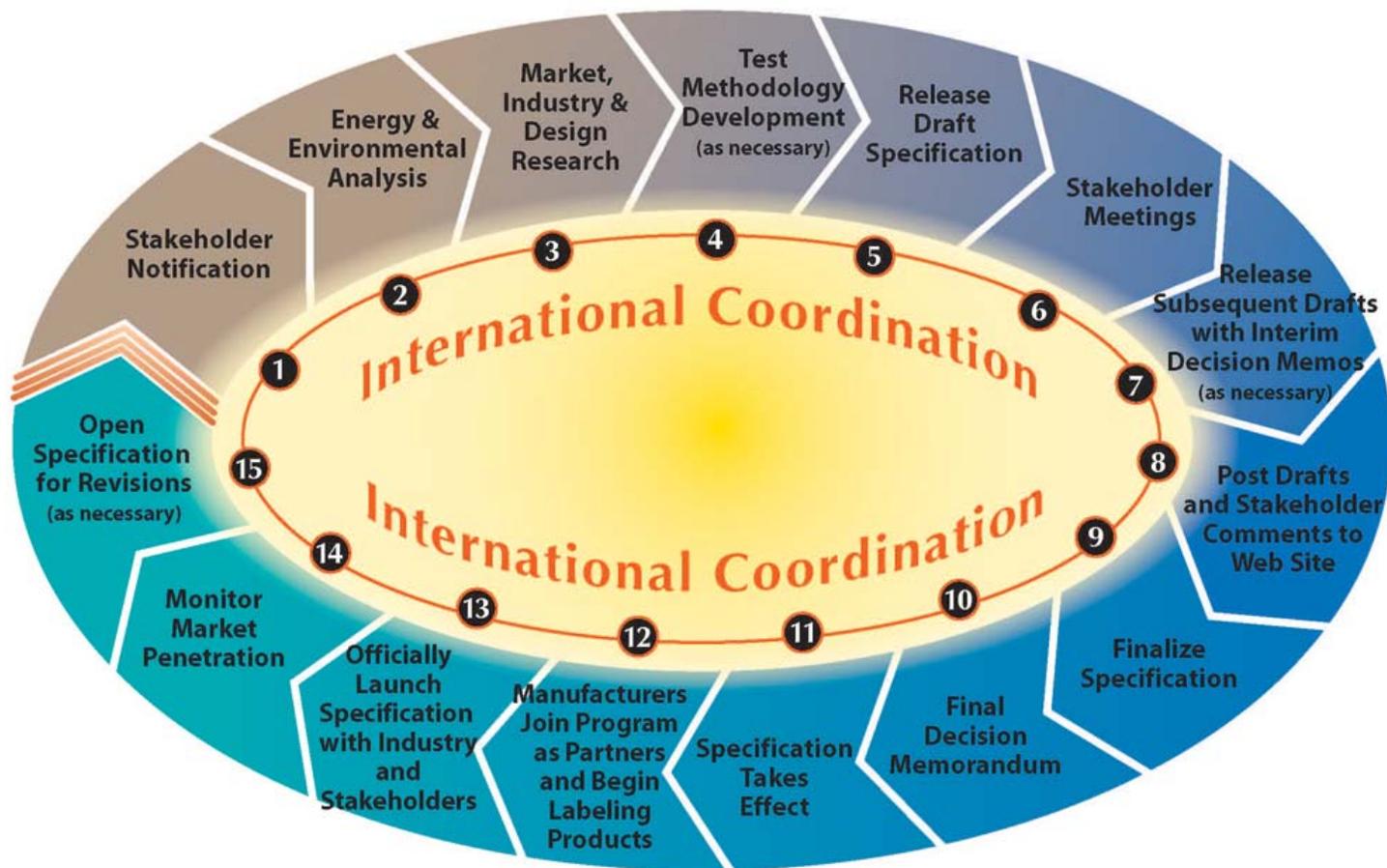


- *Recognized by over 75% of Americans*
- *An internationally recognized (and implemented) brand*

# Specification Development Process



## Specification Development Cycle



# Specification Development:

## Tiers and Effective Dates

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- EPA has established a “tiered” requirement system in numerous electronics product categories
  - Framework for future requirements and/or product coverage communicated in specification
  - Proposed effective date for future versions noted
  - Products or concepts requiring further investigation can be assigned to future tiers
- As a new program for ENERGY STAR, the SNE specification will go into effect immediately after the Final Specification is published

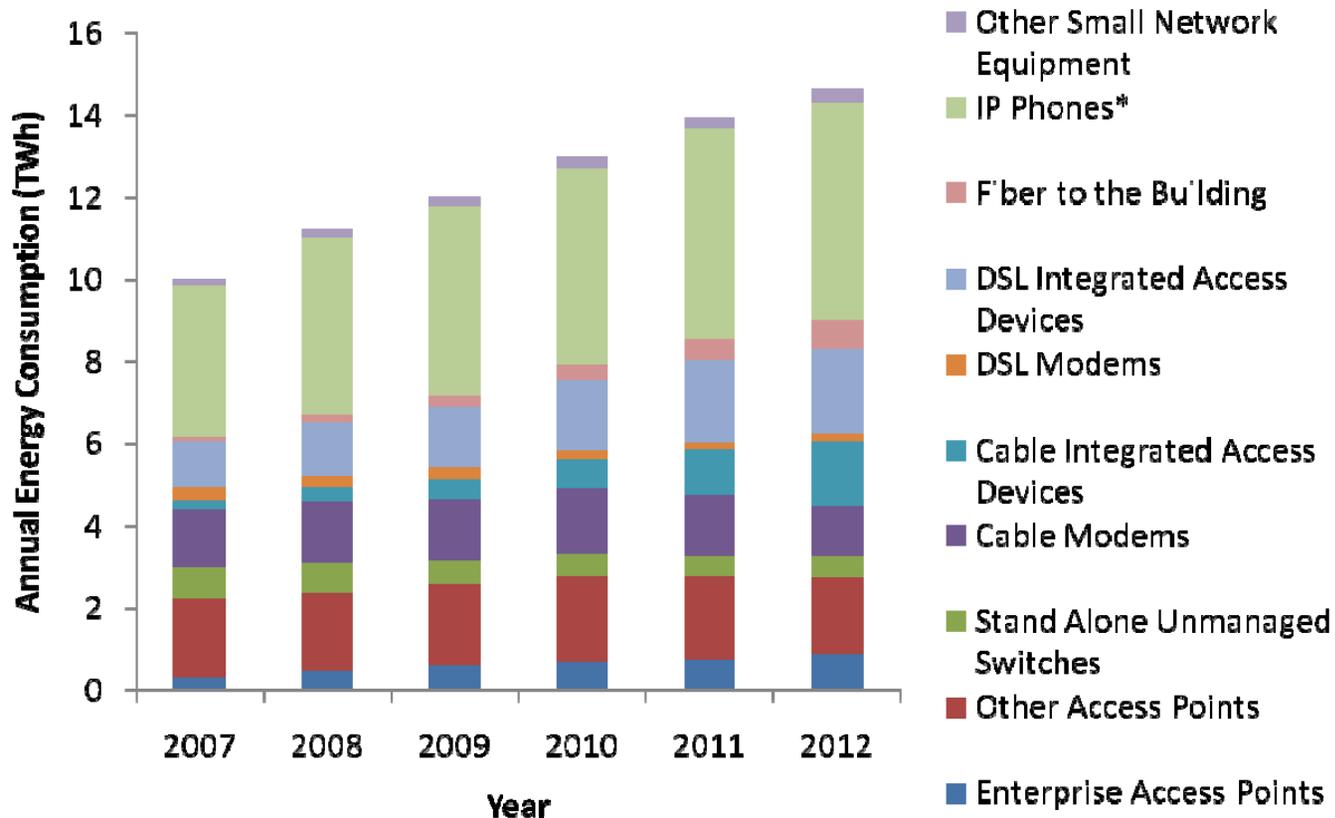
# Why is ENERGY STAR Interested in Small Network Equipment (SNE)?

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- Large aggregate savings potential - shipments of nearly 20 million units in 2008 (*Infonetics*)
- Many SNE devices operate continually irrespective of network traffic
- Demand for network equipment continues to increase as more audio/video devices gain network connectivity
- Many existing ENERGY STAR electronics programs rely on networking to deliver primary functions

# Energy Use of Small Network Equipment and IP Telephony



\* IP Phone estimates are not well validated and should be considered very rough. IP Phones are not currently a part of the scope for the Small Networking Equipment specification



Steven Lanzisera, Bruce Nordman, LBNL Nov. 2009

Years 2007-2008 are estimates, years 2009-2012 are forecasts

Sources: Infonetics, FCC, LBNL Market Research, LBNL power and usage estimates

# Connections to Existing Products



- Numerous existing ENERGY STAR products rely on network connectivity
- EPA has begun to investigate efficiency of the network in sleep as part of some programs (*IEEE 802.3az, Full Network Connectivity*)
- ENERGY STAR External Power Supplies are being used in SNE today



# Initial Approach

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- Encourage low power consumption at typical usage conditions
- Promote improved power management – adjust energy consumption to network conditions
- Support “ecosystem” efficiency – help improve efficiency of networked devices
  - Energy Efficient Ethernet
  - Network Proxying
- Build on existing ENERGY STAR resources
  - Power supply efficiency, program structure
- Harmonize where possible with existing test methods
  - EU Code of Conduct
  - Others?

# EU Code of Conduct



- Version 3 released in November 2008 and covers *home gateways, simple broadband access devices, home network infrastructure devices,* and other network products
- The Code of Conduct (CoC) and ENERGY STAR programs share the goal of improving energy efficiency, but take different approaches
  - ENERGY STAR: Sets efficiency levels on a product-by-product basis with the goal of identifying the top 25% of efficient products in a given market
  - CoC: sets requirements for participant companies in baseline efficiency levels for a percentage of new products and procurement levels for companies
- EPA collaborates with the European Commission through the ENERGY STAR program and intends to work closely with the EC to harmonize definitions and test methods as appropriate with the CoC
- Further information:  
[http://re.jrc.ec.europa.eu/energyefficiency/html/standby\\_initiative\\_broadband%20communication.htm](http://re.jrc.ec.europa.eu/energyefficiency/html/standby_initiative_broadband%20communication.htm)



# I. Definitions and Concepts

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Learn more at [energystar.gov](http://energystar.gov)

# Definitions

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- Goals for discussion:
  - Focus on definitions related to scope and usage modes
  - Share EPA's intent and note initial stakeholder comments
  - **Product coverage will be discussed in the next portion of the meeting**

# Definitions

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- EPA prefers to adopt existing definitions that are generally accepted by industry
- In cases where industry accepted definitions are not available or appropriate, EPA will work with stakeholders to develop acceptable definitions

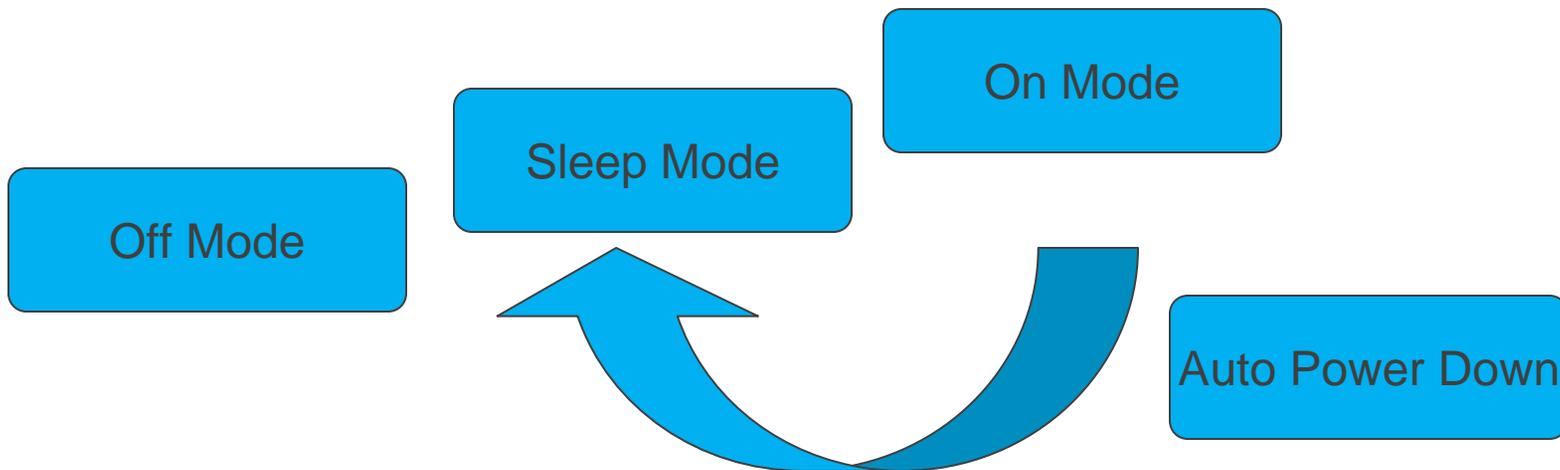
# Definitions – Program Scope



- **Network Equipment:** A device whose primary function is to pass Internet Protocol traffic among various network interfaces / ports.
- **Small Network Equipment (SNE):** Network Equipment that is neither rack-mounted nor intended for use in standard equipment racks. SNE covered by this specification is limited to devices meeting the following criteria:
  - Designed for stationary operation;
  - Contains no more than nine wired network ports;
  - Meets the definition of one or more of the Product Types defined below.

- These definitions define the scope of the SNE program
- Intended to broadly capture the current and future market
  - Final bullet fine tunes the scope to a set of products directly evaluated by the program
- Stakeholders commented that some revision to the port definition might be necessary and that there could be future overlap with Set-Top Boxes (another ENERGY STAR program)

# Definitions – Operational Modes



- Proposed definitions are adapted from modes established in other ENERGY STAR programs
- EPA is aware of CoC definitions for *Full Power State*, *Low Power State*, and *Standby State*
- Stakeholders commented on the lack of an off mode in “life line” applications
- Suggested alignment with the CoC definitions

# Discussion

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- Are there alternate definitions for SNE that should be reviewed and considered by EPA?
- Are definitions of operational modes clear and applicable in general to the SNE market? Are there types of low power modes that currently exist which are relevant, and can be defined and included?



## II. Scope and Product Areas

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# Program Scope

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- Goals: discussion of proposed product types eligible for the program
  - Identify products with near term efficiency opportunities
    - Which products should be included initially, which could best be evaluated in future tiers
  - Consider maturity of technology and products



# Proposed Tier 1 Products

- *Wired Router*
  - *Wired Switch*
  - *Access Point*
  - *Broadband Modem (DSL and Cable)*
  - *ONT Device*
  - *IHAD (DSL and Cable)*
- 
- Stakeholder comments were mixed – support for the proposed scope and suggested areas for expansion (e.g. cable, MOCA, PON, G.hn, Powerline networking)
  - Possible overlap in future between IHADs and STBs
  - Anticipated trends toward integrated storage capability

# Discussion



- Are there any SNE products missing from the list of products under consideration for Tier 1?
- Is supply of PoE an expected technology in the SNE market? Are more devices that support supplying PoE expected in the future? How should test procedures accommodate SNE powered over PoE?
- EPA is aware of the growth potential in ONT devices as direct fiber connections to the home become more prevalent. What does EPA need to know about how ONTs perform from an energy perspective?



# III. Features and Testing Approach

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Learn more at [energystar.gov](http://energystar.gov)

# Features and Testing Approach

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- Goals:
  - Review features noted in the Draft Framework
  - Overview of Energy Efficient Ethernet and Network Proxying
  - Test procedure issues



# Features to Consider

- ***Ethernet***
  - *802.3az (Energy Efficient Ethernet)*
  - *Automatic unused port power-down*
  - *System detects and disables power to disconnected Ethernet ports*
  - *Adaptive port power based on cable length*
  - *Ability to enable/disable PoE*
- ***Wireless: TBD***
- ***Power Supply Efficiency (ENERGY STAR EPS, Internal Power Supply efficiency requirements)***

# Power Management



- *Device Auto Power Down*
- *Network Monitoring*

- EPA seeks comment on the existence & utility of Auto Power Down in SNE
  - scheduling capability to power down based on user preferences (with a local or web interface)
  - timed “sleep” requirements
- Monitoring features
  - providing usage and power information about SNE and connected devices
  - inform end-users of opportunities to power down end point devices during periods of inactivity

# Efficient Network Ecosystem



- Energy Efficient Ethernet – IEEE 802.3az
  - Reduce energy use of Ethernet by rapidly entering a low-power idle state when no data to transmit
  - Standard under development – expected to be finalized in late 2010
  - Requires compliant hardware on both sides of the link
- Network Connectivity in Sleep – “Proxying”
  - Enabling a device to maintain “full” network presence while in sleep mode
  - Conditionally adopted into the ENERGY STAR Computer specification
  - Ecma International standard recently completed  
[www.ecma-international.org/memento/TC32-TG21.htm](http://www.ecma-international.org/memento/TC32-TG21.htm)

# Test Procedure Guiding Principles

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- Measure SNE products in typical use
- Simplicity, repeatability
- Harmonize with other organizations
- Test procedure separate from calculations done on measurements

# Measurement

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- Test conditions from other ENERGY STAR test procedures – temperature, humidity, power input, etc.
- Configurations will be a challenge
- Test as shipped
- Test under several usage scenarios
  - Utilization, ports, technologies, etc.
- Measure with devices connected and data flowing

# Test Procedure Outline

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- WAN port connected to a source
- Test several connectivity configurations
  - Number of ports
  - Physical layers
- Test several throughput levels
- Wireless issues
  - Multiple wireless flavors
  - Faraday cage needed?



# Discussion

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- Feedback on procedure outline?
- Are there any concerns/support for features included in the preliminary list? Are there additional features EPA should be aware of that represent energy saving opportunities?
- Power Management – how can SNE adapt power consumption to network needs?

# SNE Test Procedure and Structural Approach

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- Goal and approach
  - Rank devices to determine qualification level
  - Jointly refine test procedure and spec structure
    - Measure the things that may affect the spec
    - Avoid measuring unnecessary characteristics
  - Evaluate the impact of utilization
  - A draft procedure will be distributed in December

# Data Collection Process

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- First version of procedure used to provide data to EPA
  - Manufacturers test many products
  - EPA uses results to simplify procedure and generate draft qualification levels
  - Intend little retesting for final qualification – procedure modified to preserve relevance of existing data
  - Revised procedure will be used for testing of additional products

# Categorization

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- Categories integrated into requirements to ensure like systems are compared
- Test and qualify different products based on functionality
  - Type (Wired, Wireless, Wired/Wireless, Cable, etc)
  - Throughput (speed)
  - Size (capacity)
  - Other features?
- Categories set after data collection

# Efficiency Requirements



- To evaluate product efficiency, EPA proposes a “Base plus Adder” allowance structure
  - Based on collected data
  - **Base:** power consumption for core functionality
  - **Feature Power Allowances (“Adders”):** Extra power for additional functions
- This method is used in
  - Many Energy Star specifications
  - EU Code of Conduct
  - Industry energy efficiency network equipment procedures

# Efficiency Requirements



- Example: ENERGY STAR Desktop Computers

- Base value derived from product configuration and data analysis
- Additional memory, functionality receive allowances over the base value

TEC (kWh)	Category A: $\leq 148.0$	
Capability Adjustments		
Memory	1 kWh (per GB over base) <i>Base Memory:</i> <u>Categories A, B and C:</u> <u>Category D:</u>	2 GB 4 GB

- The Imaging Specification provides a good example for adders for network interfaces

# Discussion

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- Stakeholders commented to EPA that the expected duty cycle of SNE primarily consists of “idle” with very short periods of active use and short (if any) periods in low power modes. Are there any comprehensive studies of SNE usage patterns that should be considered by EPA?
- Should the reference level be a weighted average of power over different utilization levels?
- What variables should initial testing cover?



# Wrap Up

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# Tentative Timeline: Upcoming Milestones



- December 1
  - *First Draft Test Procedure* Distributed
  - Comments Due to EPA on stakeholder meeting
    - Early thoughts on proposed test procedure strawman presentation appreciated as soon as possible
- December 10
  - **Technical Conference Call:** EPA will send out an invitation to invite interested stakeholders to a conference call discussing the specifics of the First Draft Test Procedure
- Future Updates
  - *Second Draft Test Procedure* and Comment Period
  - *Draft 1 Specification* and Comment Period
    - Focus on structure and definitions, levels likely TBD

# Thank You

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Thank you for your participation and support of the ENERGY STAR program.

**Please address questions and comments to:**  
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Materials will be posted to the ENERGY STAR Small Network Equipment Revision page:  
[www.energystar.gov/NewSpecs](http://www.energystar.gov/NewSpecs)



# *Back up slides*



Learn more at [energystar.gov](https://energystar.gov)

# ENERGY STAR Program Overview

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- More than 60 types of products carry the ENERGY STAR label.
- More than 2,000 manufacturing partners
- Since 2000 American consumers have purchased more than 2.5 billion ENERGY STAR qualified products
- Of households that recognized the ENERGY STAR label (aided) and purchased a product in a relevant product category within the past 12 months, 73% purchased an ENERGY STAR-labeled product.



# Definitions – Product Types

- **Wired Router:** A network device that determines the optimal path along which network traffic should be forwarded. Routers forward packets from one network to another based on network layer information. Wired Routers with Wi-Fi capability as a primary function are either Access Points or Integrated Home Access Devices.
- **Wired Switch:** A network device that filters, forwards, and floods frames based on the destination address of each frame. The switch operates at the data link layer of the OSI model. Wired Switches with Wi-Fi capability as a primary function are either Access Points or Integrated Home Access Devices.
- **Access Point:** A device that provides IEEE 802.11 (Wi-Fi) connectivity.
- **Broadband Modem:** A device that transmits and receives digitally-modulated analog signals over a wired network.

- Access Points vs. Wired Routers/Switches (“Wi-Fi capability as a primary function”)

# Definitions – Product Types (Continued)



- **End Point Device:** A device that functions as either an originator or destination for network traffic passed through Network Equipment. Examples of end point devices include computers, servers, set-top boxes, IP-capable televisions, etc. An end point device is not network equipment.
- **Integrated Home Access Device (IHAD):** A network device that includes the capability of a Broadband Modem, a Wired Router, and/or Wireless Router. IHADs may be referred to as Gateways.
- **Wi-Fi Extender:** A network device that functions to increase the coverage area of a Wi-Fi network by linking to other Wi-Fi devices using only the wireless link. These devices may alternately be classified as Wi-Fi Repeaters.
- **Optical Network Termination Device (ONT):** A device that converts signals between copper (wired) or wireless connections and an optical fiber connection. ONTs are available in either desktop or building-mounted versions with different connectivity options.

# Test Procedure Strawman: Utilization Levels

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- Measure at different utilization levels
  - low utilization (i.e.; data traffic and data rates)
  - moderate utilization
  - high utilization
- Test at different speeds
  - Important for 802.3az, 802.11, etc.

# Test Procedure Strawman: Wired Networking

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- WAN port connected and live to a simulated source
- 3 LAN port tests
  - 1 LAN port connected
  - ½ of all LAN ports connected
  - All LAN ports connect
- All 3 LAN port tests are connected to live devices

# Test Procedure Strawman:

## Wireless Networking

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- WAN port connected and live to a dummy source
- LAN Client Tests
  - 1 live client
  - 5 live clients
  - 10 live clients
- Faraday Cage needed? Cross network interference and non UUT device network probing will be an issue otherwise
- Frequencies? Test on one or multiple? How about multi-frequency devices simultaneously?